Partial English translation of JP-A-11-347585 (Ref.6)

(page 2, left column, line 1 to page 2, right column, line 3)

SPECIFICATION

[Title]
SEWAGE TREATMENT APPARATUS

[Claims]

1. A sewage treatment apparatus for supplying air from air supply sections into sewage flowing in a treatment tank to aerate the sewage, which is provided with a plurality of the air supply sections and has a configuration, in which a blower device for sending air to the air supply sections is provided to each of the air supply sections, and the blower devices are individually controlled.

2. The sewage treatment apparatus according to claim 1, wherein each of the blower devices provided to each of the air supply sections is consisted of a plurality of blowers each controlled individually.

3. The sewage treatment apparatus according to claim 1 or claim 2, wherein a plurality of oxygen concentration detection means for detecting the dissolved oxygen concentration of the sewage in the treatment tank are provided to each of the corresponding air supply sections.

4. The sewage treatment apparatus according to claim 3, wherein the air blow amounts of each of the blower devices provided to each of the air supply sections are controlled so that the detected concentration by the oxygen concentration detection means provided to each of the corresponding air supply sections become a predetermined concentration.

5. The sewage treatment apparatus according to any one of claims 1 to 4, which is provided with air amount detection means for detecting the air blow amounts sent to each of the air supply sections, and configured so as to determine whether clogging of the air supply sections is present or not, from the detected air amount by the air amount detection means and the load of the blower device.

6. The sewage treatment apparatus according to any one of claims 1 to 5, which is provided with air amount detection means for detecting the air blow amounts sent to each of the air supply sections, and configured so that,

when the detected air amount by the air amount detection means is decreased, the discharged air amounts by the blower devices of neighboring air supply sections are controlled to be increased.

7. The sewage treatment apparatus according to claim 3 or 4, wherein a plurality of the oxygen concentration detection means are divided into sets of two, and which is configured so that, when difference between the detected concentrations by two oxygen concentration detection means constituting a set, exceeds a predetermined value, one of the oxygen concentration detection means is determined to be in a failed state.

8. The sewage treatment apparatus according to claim 7, which is configured so that, when one of the oxygen concentration detection means is failed, the oxygen concentration to be detected by the failed oxygen concentration detection means is estimated from the detected concentrations by other oxygen concentration detection means neighboring to the failed oxygen concentration detection means.

9. The sewage treatment apparatus accor ding to any one of claims 3, 4, 7 and 8, which is provided with flow amount detection means for detecting flowing-in amount of the sewage into the treatment tank, calculates an amount of air to be supplied to the entire treatment tank from the detected flow amount by the flow amount detection means and the detected concentration by the oxygen concentration detection means, and controls the entire amount of air so as to be shared as the discharged air amounts by each of the blower devices.

10. The sewage tr eatment apparatus according to any one of claims 1 to 9, which is provided with air flow amount detection means for detecting air blow amounts to each of the air supply sections, and configured so that, when an air supply section is present, of which detected air amount by the air amount detection means is decreased, the amounts of air to be supplied to the other air supply sections are reset from the positions of the other air supply sections and the amount of air to be supplied to the entire treatment tank.

(page 3, left column, line 2 to page 4, left column, line 24)

[Detailed Description of the Invention]

[0008]
[Means for solving Problems]
According to the configuration, since a blower device is provided to each of the air supply sections in a relationship of 1:1, the amounts of air supplied from each of the air supply sections can be individually controlled, enabling optimum amounts of air to be supplied to each of the sections of the treating tank.

[0009]
[Embodiment of the present Invention]
Hereinafter, an embodiment of the present invention applied to the aeration tank of a sewage treatment apparatus will be described with reference to Figs. 1 to 4. Fig. 1 illustrates an aeration tank 11 in the sewage treatment apparatus. In the aeration tank 11 as a treatment tank, a flow-in section 12 is connected to a primary settling basin, a flow-out section 13 is connected to a final settling basin, and between the flow-in section 12 and the flow-out section 13 inside the aeration tank 11, a plurality of air diffusion pipes 14 as air supply sections are arranged. In addition, although the air diffusing pipes 14 are not illustrated in the figure in detail, each of them has a form of a pipe provided with many small holes, and air is blown out from the small holes.

[0010]
The air supplied to each of the air diffusion pipes 14 is taken in from an air induction pipe 15. From the air induction pipe 15, a plurality of branch pipes 16 are branched, and each of the branch pipes 16 is connected to one blower 17 constituting a blower device. And the air sent out from each of the blowers 17 is sent to the corresponding air diffusion pipe 14 through an air-pipe 18, to be supplied into the sewage in the aeration tank 11.

[0011]
The blowers 17 are individually controlled by corresponding blower control devices 19 as exclusive blower control means, respectively. As illustrated in Fig. 2, each of the blower control devices 19 includes a CPU 20 as a control section, a ROM 21 in which a control program or the like is stored, a RAM 22 for temporarily memorizing various kinds of data or the like, an inverter device 23 for driving a motor (hereinafter, blower motor) 17a of the blower 17, and the like.

[0012]
Each of the air-pipes 18 is provided with an air amount detector 24 as air amount detection means for detecting the amount of air blown into the air diffusion pipe 14 from the corresponding blower 17. Moreover, in the aeration tank 11, a plurality of DO detectors 25 are provided as DO detection means in a relationship of 1:1 with respect to the air diffusion pipes 14 so that DO values of each section inside the aeration tank 11, that is each part aerated by each of the air diffusion pipes 14, are detected. As illustrated in Figs. 3 or 4, the air amount detector 24 or the DO detector 25 is consisted of an air amount sensor 26 for detecting an air amount or a DO sensor 27 for detecting DO, CPU 28 or 29 as a control section, ROM 30 or 31, RAM 32 or 33, and the like.

[0013]
Here, the CPU 20 of the blower control device 19, the CPU 28 of the air amount detector 24, and the CPU 29 of the DO detector 25 are formed as a CPU with a communication circuit, respectively. And the CPUs 20, 28 and 29 are connected to a communication line for example, a network 34, such as a LAN. To the network 34, other than the blower control devices 19, the air amount detectors 24, and the DO detectors 25, a man/machine interface 35 is connected, which is consisted of a microcomputer equipped with, for example, a keyboard and a display. And each of the blower control devices 19, each of the air amount detectors 24, each of the DO detectors 25, and the man/machine interface 35, are added with an ID number, respectively, each of which can communicates with each other by specifying the ID number.

[0014]
In this Example, each of the blower control devices 19 communicates with the corresponding DO detector 25 to obtain the detected information on the DO value, and sets an objective air amount so that the detected DO value to be an objective DO value memorized in advance. Moreover, each of the blower control devices 19 communicates with the corresponding air amount detector 24 to obtain the detected information on the air amount, and controls the rotation number of the blower motor 17a so that the detected air amount to be the objective air amount.

[0015]

The man/machine interface 35 is intervened between an operator and the devices 19, 24 and 25, and has a function of giving an operation command or a stop command to each of the blower control devices 19 to start or stop the operation of the corresponding blower 17. Moreover, in order to allow the operator watching the operational state of the aeration tank 11, the man/machine interface 35 accesses to each of the blower control devices 19, each of the air amount detectors 24, and each of the DO detectors 25 to display the operational states and the air blow amounts of each of the blowers 17, the DO values of each sections of the aeration tank 11, and the like. Further, in the feed-back control of each of the blower control devices 19, which controls the corresponding blower 17 so that the detected air amount to be the objective air amount, the man/machine interface 35 is used for controlling the gain so that a suitable feed-back control can be performed.

[0016]
In the above mentioned configuration, the sewage flowing into a sewage disposal plant is first subjected to removal of the big inclusions thereof, such as sands, gravels, and wood chips, in a sand basin, and subsequently, enters a primary settling basin to be subjected to a settling treatment of the suspended matters thereof. After that, the sewage flows into the aeration tank 11, and the polluted part thereof is solidified by the biochemical reactions of microbes in active sludge, subsequently, the sewage is subjected to a settling treatment in a final settling basin and flown into a river etc.

[0017]
On the other hand, in order to aerate the aeration tank 11, each of the blowers 17 inhales air from the air induction pipe 15, and sends it to the corresponding air diffusion pipe14 through the corresponding air-pipe 18. The air sent to each of the air diffusion pipes 14 is supplied into the sludge from the small holes of each of the air diffusion pipes 14. In the operation of each of the blowers 17, the corresponding blower control device 19 determines the objective air amount from the DO value obtained from the corresponding DO detector 25, and the objective DO value, and controls the corresponding blower motor 17a so that the air amount obtained from the corresponding air amount detectors 24 to be the objective air amount.

[0018]
As mentioned above, since the blowers 17 are provided in a relationship of 1:1 with respect to a plurality of the air diffusion pipes 14 arranged in the aeration tank 11, the amount of air to be supplied to the aeration tank 11 from each of the air diffusion pipes 14 can be controlled for each of the air diffusion pipes 14. By the reason, since the amount of air to be supplied to the aeration tank 11 from each of the air diffusion pipes 14 can be determined depending on the DO values of the corresponding section in the aeration tank 11, each of the sections of the aeration tank 11 can be controlled to be an optimum DO value at which the biochemical reactions of the microbes contained in the active sludge are performed.

[0019]
Moreover, since the DO detectors 25 are provided in the aeration tank 11 corresponding to each of the air diffusion pipes 14, the DO values of the aeration regions shared by each of the air diffusion pipes 14 can be detected, enabling the corresponding blower 17 to be controlled so that the air blow amount thereof become suitable for the aeration region shared by the corresponding air diffusion pipe 14. At that time, since like the present Example, the detected values of the each of the air amount detectors 24 and each of the DO detectors 25 are given to the corresponding blower control device 19, and each of the blower control devices 19 determines the objective air amount from the detected DO value and the objective DO value and subjects the corresponding blower 17 to a feed-back control so that the detected air amount becomes the objective air amount, as mentioned above, an automatic control can be performed, in which each of the blowers 17 is operated so that the air blow amount becomes suitable for the DO value of the corresponding section.

(page 5, right column, line 48 to page 6, right column, line 5)

[Brief Description of Drawings]
Fig. 1 is a schematic configuration view illustrating an Example of the present invention;
Fig. 2 is a block diagram of a blower control device;
Fig. 3 is a block diagram of an air amount detector;
Fig. 4 is a block diagram of a DO detector;
Fig. 5 is a view illustrating another Example of the present invention, which is equivalent to Fig. 1; and
Fig. 6 is a view illustrating a prior art Example, which is equivalent to Fig. 1.

[Description of Reference Numerals]

Reference numeral 11 denotes an aeration tank (a treatment tank); reference numeral 14 denotes air diffusion pipes (air supply sections);reference numeral 17 denotes blowers (blower devices); reference numeral 19 denotes blower control devices (blower control means); reference numeral 24 denotes air amount detectors (air amount detection means); reference numeral 25 denotes DO detectors (dissolved oxygen concentration detection means); reference numeral 36 denotes a blower device; reference numerals 37a to 37c denote blowers, respectively; and reference numerals 38a to 38c denote blower control devices, respectively.